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(54) Title of the Invention:

THERMISTOR PRESSURE DETECTION DEVICE

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SPECIFICATION

1. Title of the Invention:

THERMISTOR PRESSURE DETECTION DEVICE

2. Scope of the Patent Claims:

(1) Thermistor pressure detection device, where a thermistor is heated in a gas and the change in its electrical resistance due to the release of heat by the thermistor is detected to determine the pressure of the aforementioned gas, characterized in that the surface of the aforementioned thermistor is coated with an oxidative catalyst

(2) Thermistor pressure detection device as described in Claim 1, characterized in that the oxidative catalyst composition is [(γ-MnO_2) + (Zn-Mn-FeO_x) + α-Al_2O_3, zeolite)], or with the addition of a platinum family element and glass frit.

(3) Thermistor pressure detection device as described in Claim 2, characterized in that the frit used is silicate glass.

(4) Thermistor pressure detection device as described in Claim 1, characterized in that the thermistor is made of a silicon carbide.

(5) Thermistor pressure detection device as described in Claim 1, characterized in that the silicon carbide thermistor is a thin-film silicon carbide thermistor made of a silicon carbide thin film formed by sputter vapor deposition on an alumina base board.

3. Detailed Description of the Invention:

The present invention pertains to a gas pressure detection device in which a thermistor is used. To be more specific, the present invention pertains to a pressure detection device effective for the detection of gas pressure in a contaminated atmosphere

consisting of organic substances.

A thermistor is a passive semiconductor device whose electrical resistance varies with temperature. Furthermore, when a thermistor is heated to a specified temperature by, for example, self-heating by passing an electric current through it or by external heating with the use of a heater, the heat released by the thermistor will change due to the change in pressure around it. This phenomenon can be utilized in the detection of gas pressure by the thermistor. A pressure detection device of this type is usually called a thermistor pressure detection device.

When a thermistor pressure detection device of this kind is placed in a pressure detection atmosphere containing organic substances such as un-burnt gases, soot, etc., will adhere to the surface of the thermistor element. This phenomenon may cause a practical problem in that the adhering substances may change the characteristic of the detection element.

The purpose of the present invention is to eliminate the shortcoming of the conventional devices mentioned above and to provide a thermistor pressure detection device whose characteristic will not change even in a contaminated atmosphere.

The present invention will now be described in detail with the use of actual examples.

Figure 1 shows an actual example of the sensor portion (10) of the thermistor pressure detection device of the present invention. It is made of the thermistor element (11), the oxidative catalyst (12) covering the surface of the thermistor element (11), and the lead wires (13) of the thermistor element (11).

Figure 2 shows an actual example of the detection portion (20) of the pressure

detection device using the thermistor element (11) shown in Figure 1. The thermistor element (11) is affixed to a pair of thermistor support lead parts (24) with the use of thin wire such as a platinum wire. These support lead parts (24) are affixed to a base (25). For example, when an electric current is allowed to pass through the thermistor element (11) and through the support leads (24), the temperature of the thermistor element (11) will rise. We found that when pressure detection was carried out under the conditions mentioned above, even in the presence of organic substances such as carbon in the atmosphere, the organic substances would not adhere to the thermistor element (11) because of the effect of the oxidative catalyst (12).

This finding is probably due to the fact that the organic substances that contact the thermistor element (11) will burn and be vaporized by the action of the oxidative catalyst (12) present on the surface of the thermistor element (11).

We also found that the optimum composition of the oxidative catalyst in the sensor portion (10) shown in Figure 1 corresponded to its usage. In other words, for the measurement of gas pressure in an environment with the presence of oil soot, etc., the thermistor element (11) is self-heated or heated with the use of an external heater to a temperature of 200°C or more to give an oxidative catalyst compostion of [(γ-MnO_2) + (Zn-Mn-FeO_x) + α-Al_2O_3, zeolite)]. This oxidative catalyst is then mixed with glass frit and allowed to adhere to and cover the aforementioned thermistor element (11). As a result, the thermistor element will not be contaminated by the environment. In this case, it is preferable that the frit used is low melting glass. Lead glass is a known suitable example for applications of this kind. However, the use of silica glass containing 1-10 weight % of LiO_2 is more appropriate in the present invention.

Furthermore, when carbon, etc., is present in the contaminated environment, it is advantageous to add a trace amount of a platinum family element to the basic components [(γ-MnO_2) + (Zn-Mn-FeO_x) + α-Al_2O_3, zeolite)] of the oxidative catalyst.

During the operation of the thermistor pressure detection device of the present invention, the thermistor element is usually kept at an elevated temperature above 200°C in order to make the aforementioned catalytic action more effective. To achieve this, a silicon carbide thermistor with high temperature coefficient of resistance is used. A thin-film silicon carbide thermistor made of a silicon carbide thin film formed on an almina base board by sputter vapor deposition is a silicon carbide thermistor with especially high detection sensitivity and excellent heat resistance.

It can be seen from the above that the detection portion of the thermistor pressure detection device of the present invention can not be contaminated at all even in an environment contaminated mainly by organic substances. Accordingly, there are many applications in which it can be suitably used to detect the pressure in various industrial devices, such as vacuum-creating pressure-reduction devices, etc., even when organic substances, etc., are present in the environment.

4. Brief Explanation of the Figures

Figure 1 is a cross-sectional diagram showing the structure of the main portion of the thermistor pressure detection device of the present invention given as an actual example. Figure 2 is a partial cross-sectional side view of the detection portion of the thermistor pressure detection device of the present invention given as an actual example.

(11) thermistor element; (12) oxidative catalyst

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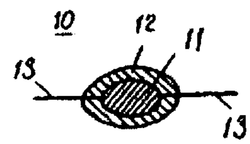

Figure 1

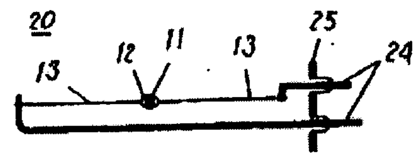

Figure 2